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APHIDS (HOMOPTERA: APHIDIDAE) OF POTENTIAL IMPORTANCE ON *CITRUS* IN THE UNITED STATES WITH ILLUSTRATED KEYS TO SPECIES

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Abstract.—In commodities produced by the U.S. in 1990, citrus ranked 16th with an approximate value of $1814 million (Florida $1316, California $472, Arizona $16, and Texas $10 million). Until recently, the brown citrus aphid (BrCA), *Toxoptera citricida* (Kirkaldy), was not known to occur in the citrus-growing areas of Central and North America. However, in 1991, one alate BrCA was collected in a trap in melon fields in Costa Rica. In 1992, several colonies of BrCA were collected in Costa Rica, Dominican Republic, Haiti, Nicaragua, and Puerto Rico. In 1993, BrCA was collected in Cuba and Jamaica. This aphid is still not known to occur in the continental United States. The citrus industry could suffer severely with the introduction into the United States of BrCA. As the principal vector of citrus tristeza virus (CTV), BrCA is a threat to uninfested *Citrus*-growing areas of the United States. The pictorial and dichotomous keys and information on taxonomic characters, hosts, and distribution included in this manuscript will be invaluable tools to those surveying for BrCA in as yet uninfested areas.

Key Words: Aphids, Aphididae, *Citrus*, citrus tristeza virus

The brown citrus aphid (BrCA), *Toxoptera citricida* (Kirkaldy), also known as the "tropical citrus aphid," was described in 1907 from specimens collected on *Citrus* throughout the Hawaiian Islands. The BrCA is thought to have originated in China and is widespread in southeastern Asia, Australia, New Zealand, the Pacific Islands, southern Africa, and subtropical and warm temperate parts of South America. Until recently, the BrCA was not known to occur in the citrus-growing area of the Middle East, the Mediterranean region, the Caribbean, or Central and North America. However, in 1991, one alate BrCA was collected in a yellow pan trap in melon fields in Costa Rica (Voegtlin and Villalobos 1992). In 1992, I identified several BrCA from collections in Costa Rica, Dominican Republic, Haiti, Nicaragua, and Puerto Rico. In 1993, I identified the BrCA from collections in Guanyamo Bay, Cuba, and in Jamaica. As of August 1993, the BrCA is still not known to occur in the continental United States.

The BrCA lives almost exclusively on Rutaceae, especially *Citrus*. Reports of other hosts are usually of a single winged specimen found resting on a nonhost or unidentified plant. As the principal vector of citrus tristeza virus (CTV), BrCA is a threat to uninfested *Citrus*-growing areas of the United States.

This paper contains a brief summary of taxonomic characteristics, usual hosts, and distribution in the United States and in the world for each of the 13 species often found on citrus plants: *Aphis craccivora* Koch,

Aphis gossypii Glover, *Aphis nerii* (Boyer de Fonscolombe), *Aphis spiraecola* Patch, *Aulacorthum solani* (Kaltenbach), *Brachycaudus helichrysi* (Kaltenbach), *Macrosiphum euphorbiae* (Thomas), *Myzus persicae* (Sulzer), *Pterochloroides persicae* (Cholodkovsky), *Toxoptera aurantii* (Boyer de Fonscolombe), *Toxoptera citricida* (Kirkaldy), *Toxoptera odinae* (van der Goot), *Toxoptera victoriae* Martin. All of these species have *Citrus* as a common host or they are polyphagous and have been recorded from *Citrus*. *Pterochloroides persicae* is found on the bark. While the other species may be found on older leaves, they all prefer emerging leaves. Also included is a series of 7 pictorial figures which can be used to identify 12 species, *Brachycaudus helichrysi* (Kaltenbach) not included, and dichotomous keys to both the wingless and winged adult females of all 13 species found colonizing *Citrus*. None of the keys are intended for use in identifying single, errant alate aphids that can be found resting on leaves of *Citrus* and other plants. This information has been prepared as an aid to those charged with surveying *Citrus* in areas where the BrCA is not yet known to occur. Scientific terms, such as cauda, cornicles, and terminal process, are illustrated in the pictorial key.

Materials and Methods

Information on distribution and hosts is taken from labels on slides in the National Entomological Collection, Beltsville, MD, and from records published by Palmer (1952) and Blackman and Eastop (1984). Information on virus transmission is taken from Kennedy et al. (1962) and Blackman and Eastop (1984).

In the synonymy section, one asterisk (*) represents the name under which the aphid is treated in Palmer (1952); and two asterisks (**) represent the name under which the aphid is treated in Blackman and Eastop (1984). Common names approved by the Entomological Society of America (Stoetzel 1989) are given.

In the pictorial keys, the species are grouped by the shape and color of the cornicles and by the presence or absence of a stridulatory apparatus consisting of a cuticular pattern on the venter of the abdomen and peg-like setae on the hind tibiae (Fig. 1). Characters used in the keys can be seen using a dissecting scope with a power of at least 120× (12× objecting and 10× eyepiece).

Aphids of Potential Importance on *Citrus*

Toxoptera citricida (Kirkaldy 1907) (Figs. 1–3)

****Toxoptera citricidus* (Kirkaldy)
ESA-approved common name: brown citrus aphid (BrCA)
Other common name: tropical citrus aphid

Taxonomic characteristics.—*Wingless adult female:* In life shiny, dark brown or black. Small aphid, 1.5–2.8 mm in length, oval. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI; no secondary sensoria; segments not banded, but V and VI usually progressively darker to tip of terminal process. Cornicle black, elongate. Cauda black, elongate, with 25–54 setae. Stridulatory apparatus present.

Winged adult female: In life shiny, brownish black or black. Small aphid, 1.1–2.6 mm in length. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI; secondary sensoria 7–20 on III which is wholly black and 0–4 on IV. Cornicle black, elongate. Cauda black, elongate, with 25–40 setae. Stridulatory apparatus present. Forewing with pterostigma pale and media usually twice-branched.

Hosts.—Major pest of *Citrus*. Limited largely to Rutaceae, especially *Citrus*.

Distribution in the United States.—Hawaii. Not known to occur in the continental United States.

Distribution in the world.—Asia, Africa

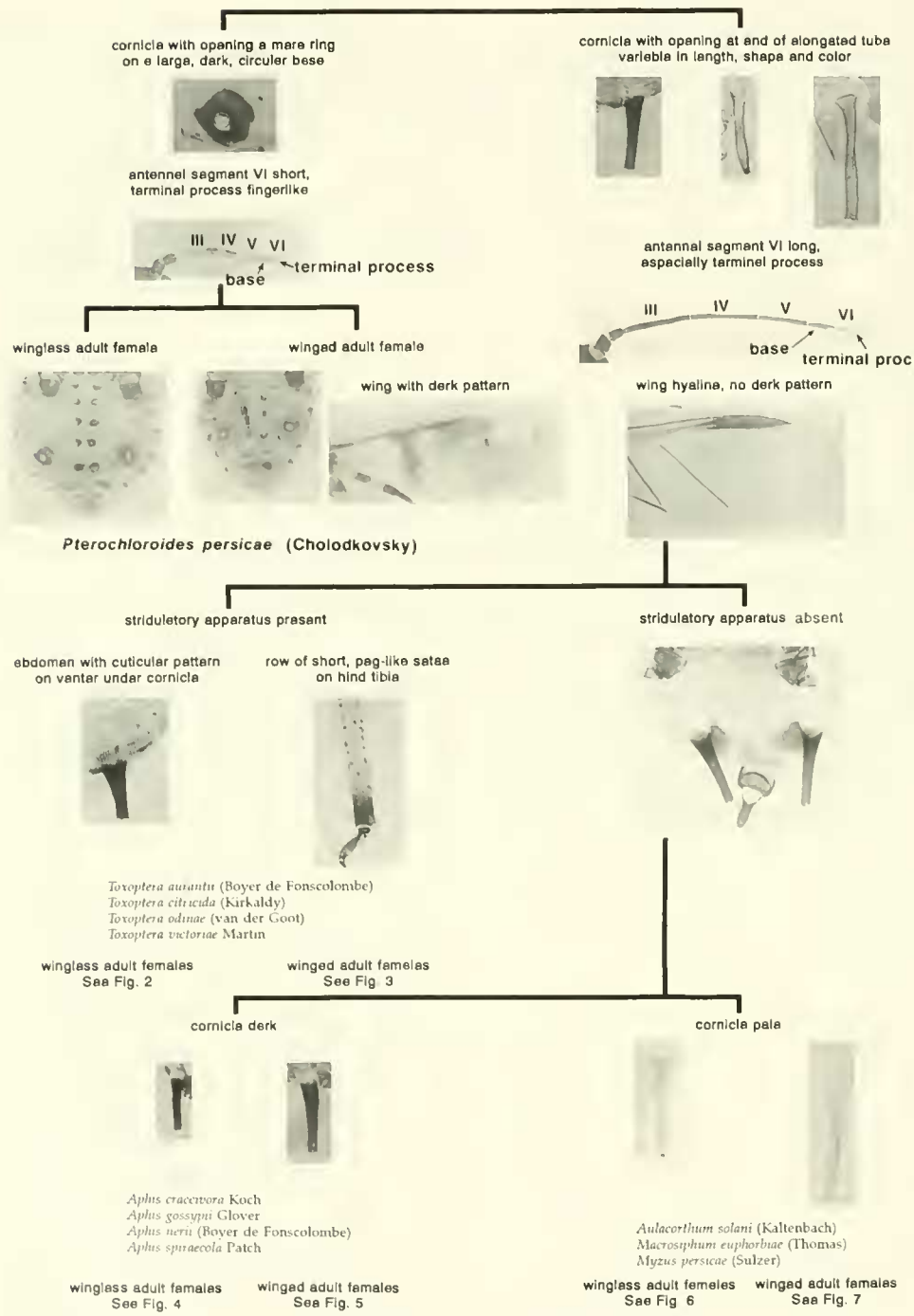

Fig. 1. Pictorial key to 12 species of aphids who are pests or potential pests of *Citrus* in the United States.

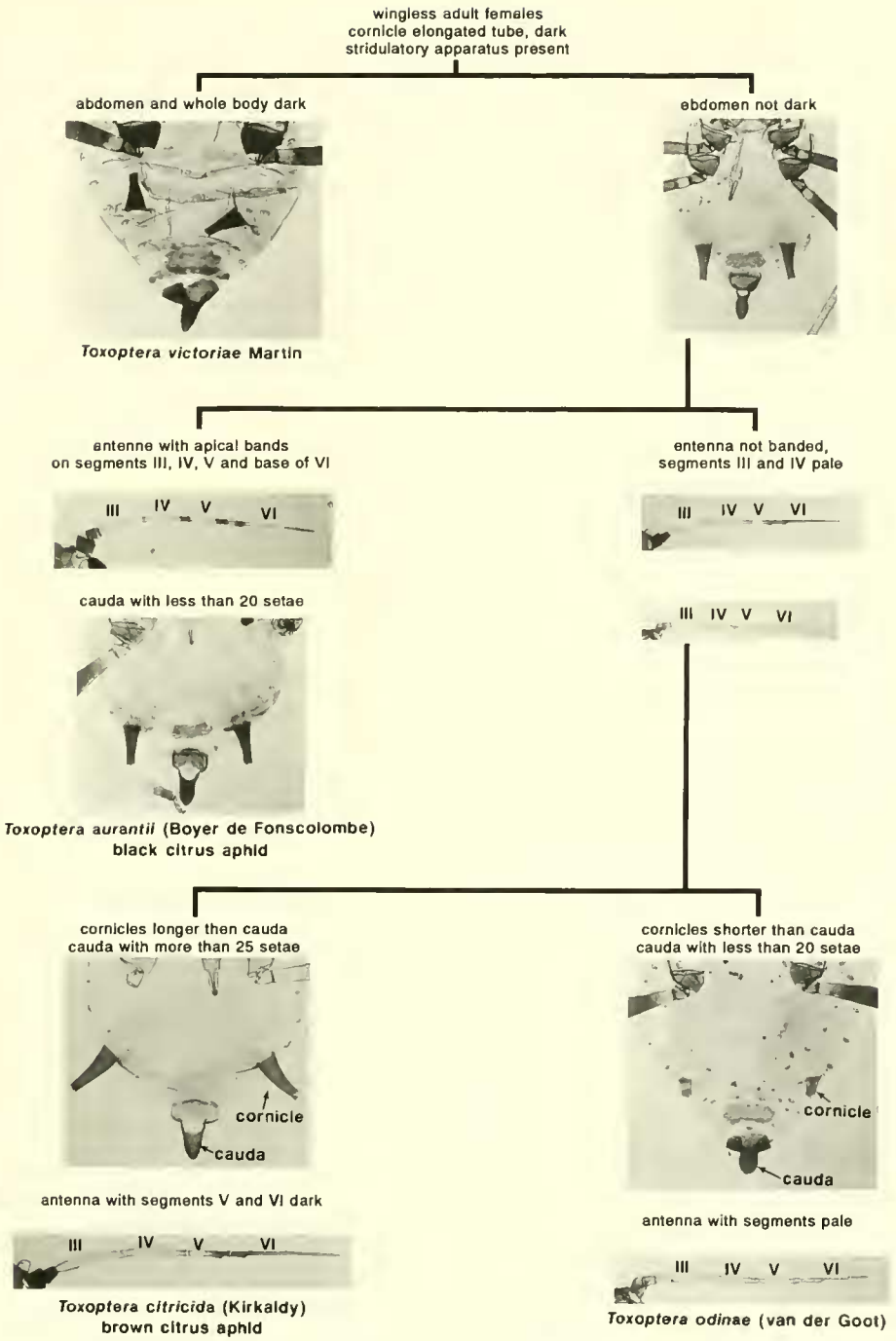

Fig. 2. Pictorial key to wingless adult females whose cornicles are dark, elongated tubes, who have a stridulatory apparatus, and who are pests or potential pests of *Citrus* in the United States.

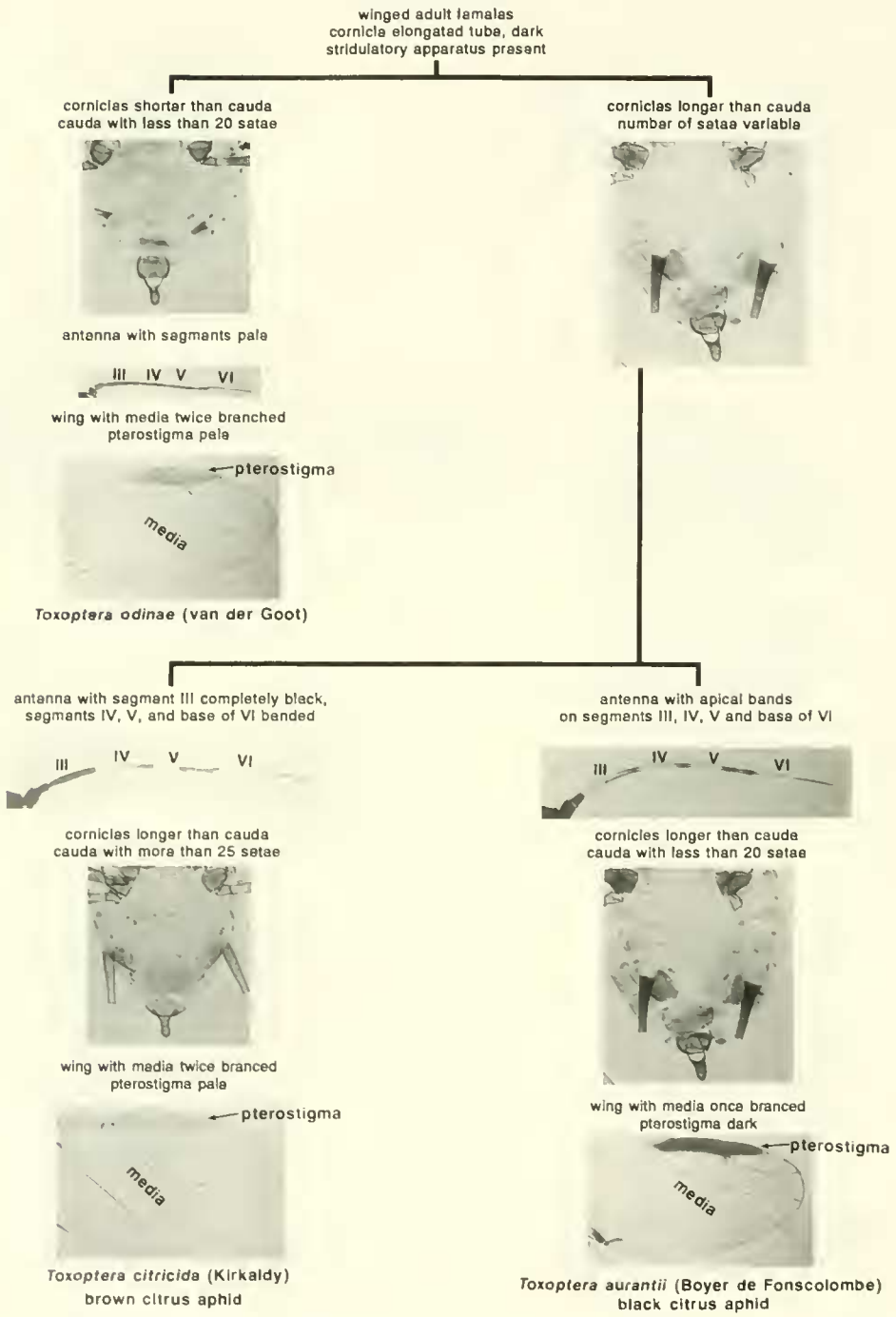

Fig. 3. Pictorial key to winged adult females whose cornicles are dark, elongated tubes, who have a stridulatory apparatus, and who are pests or potential pests of *Citrus* in the United States.

(south of the Sahara), Pacific Islands, Australia, New Zealand, South America, Central America (Costa Rica, Nicaragua), Caribbean Islands (Cuba, Dominican Republic, Haiti, Jamaica, Puerto Rico, U.S. Virgin Islands).

Discussion.—*Toxoptera citricida* was originally described from specimens collected in Hawaii and is the principal vector of citrus tristeza virus and other citrus viruses (Kennedy et al. 1962). This species can be confused with *T. aurantii,* but its antennae are not banded in all forms and the pale pterostigma and usually twice-branched media in the alata are distinctive.

Toxoptera aurantii
(Boyer de Fonscolombe 1841)
(Figs. 1–3)

***Toxoptera aurantii* (Boyer de Fonscolombe)

ESA-approved common name: black citrus aphid (BlCA)

Taxonomic characteristics.—*Wingless adult female:* In life shiny, brownish black or black; antenna white with black apical bands on segments III–VI. Small aphid, 1.1–2.0 mm, in length, oval. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI, no secondary sensoria. Cornicle black, elongate. Cauda black, elongate, with 9–19 setae. Stridulatory apparatus present.

Winged adult female: In life shiny, brownish black or black; antenna white with black apical bands on segments III–VI. Small aphid, 1.1–2.0 mm in length, oval. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI; secondary sensoria 2–8 on III and none on IV. Cornicle black, elongate. Cauda black, with 8–19 setae. Stridulatory apparatus present. Forewing with pterostigma black and media usually once branched.

Hosts.—Major pest of *Citrus.* Has been reported on a wide range of host plants in several plant families. Known to occur on several genera, including *Citrus,* in the Rutaceae. It is also a pest of cacao, coffee, gardenia, magnolia, and tea.

Distribution in the United States.—Alabama, Arizona, California, District of Columbia, Florida, Georgia, Hawaii, Louisiana, Maryland, New York, North Carolina, Oregon, Texas, and Washington.

Distribution in the world.—Throughout the tropics and subtropics including the Pacific Islands.

Discussion.—*Toxoptera aurantii* probably originated in New Zealand. It is a vector of several plant viruses including citrus tristeza virus (Kennedy et al. 1962). This species can be confused with *T. citricida,* but its banded antennae in all forms and the dark pterostigma and once-branched media in the alata are distinctive.

Toxoptera odinae (van der Goot 1917)
(Figs. 1–3)

***Toxoptera odinae* (van der Goot)

Taxonomic characteristics.—*Wingless adult female:* In life grey brown to reddish brown; antenna pale. Small aphid, 1.3–2.4 mm in length, oval. Antenna 6 segmented, terminal process 2–3 times length of base of antennal segment VI; no secondary sensoria on III; setae long and fine, length twice basal diameter. Cornicle dusky, short, less than ¾ of length of cauda. Cauda black, with 15–18 setae. Stridulatory apparatus present.

Winged adult female: In life body grey brown to reddish brown; antenna pale. Small aphid, 1.3–2.4 mm in length, oval. Antenna 6 segmented, terminal process 2–3 times length of base of antennal segment VI; 7–14 secondary sensoria on III; 0–4 on IV; setae long and fine, length twice basal diameter. Cornicle short, less than ¾ of length of cauda. Cauda black, with 15–18 setae. Stridulatory apparatus present. Forewing with pterostigma pale and media twice branched.

Hosts.—Minor pest of *Citrus*. Reported to occur on several tropical shrubs in 15 families including Anacardiaceae, Araliaceae, Asteraceae, Caprifoliaceae, Ericaceae, Pittosporaceae, Rubiaceae, and Rutaceae.

Distribution in the United States.—Not known to occur in the United States.

Distribution in the world.—Asia and Africa.

Discussion.—*Toxoptera odinae* is not known to transmit any plant viruses. Only recently was *T. odinae* discovered in Africa (Martin 1989).

Toxoptera victoriae Martin 1991
(Figs. 1–3)

Taxonomic characteristics.—*Wingless adult female:* In life body shiny black; mounted specimens with body smokey grey; nymphs dull reddish brown. Small aphid, 1.6–1.8 mm in length, oval. Antenna 6 segmented, terminal process 2–3 times length of base of antennal segment VI; no secondary sensoria; 5–7 setae on base of VI. Cornicle black, cylindrical, imbricated, approximately equal to length of cauda. Cauda black, narrowly tongue-shaped, appearing almost triangular in most specimens, with 18–24 setae. Stridulatory apparatus present.

Winged adult female: Unknown.

Host.—Status as pest of *Citrus* unknown. Known only from *Zanthoxylum scandens* (Rutaceae).

Distribution in the United States.—Not known to occur in the United States.

Distribution in the world.—Known only from Victoria Peak, Hong Kong.

Discussion.—Superficially, *T. victoriae* resembles *T. citricida* but differs in having smokey pigmentation in body cuticle and 5–7 setae on base of antennal segment VI. The one colony collected by Martin was on young shoots and was tended by ants. Although alatoid nymphs have been collected, winged adult females are unknown. *Toxoptera victoriae* is not known to transmit any plant viruses.

Aphis craccivora Koch 1854
(Figs. 1, 4, 5)

**Aphis medicaginis* Koch 1854 (misidentification)

***Aphis craccivora* Koch

ESA-approved common name: cowpea aphid

Other common names: black legume aphid, groundnut aphid

Taxonomic characteristics.—*Wingless adult female:* In life body shiny black with large black patch on dorsum of abdomen and strikingly white legs; immatures often covered with grayish wax. Small aphid, 1.4–2.0 mm in length, rounded. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI; no secondary sensoria. Cornicle black, cylindrical, more than 3 times as long as wide. Cauda black, with 7 setae.

Winged adult female: In life body shiny black with black lateral areas and bands on dorsum of abdomen and strikingly white legs; immatures often covered with wax. Small aphid, 1.4–1.9 mm, rounded. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI; secondary sensoria 4–8, 1 noticeably larger than the others, on III and none on IV. Cornicle black, cylindrical, more than 3 times as long as wide. Cauda black, with 7 setae.

Hosts.—Major pest of *Citrus*. Polyphagous but prefers plants in the Leguminosae.

Distribution in the United States.—Throughout the United States.

Distribution in the world.—Throughout the world.

Discussion.—*Aphis craccivora* is a vector of about 30 plant viruses (Blackman and Eastop 1984). Colonies are regularly tended by ants.

Aphis gossypii Glover 1877
(Figs. 1, 4, 5)

*,***Aphis gossypii* Glover

ESA-approved common name: cotton or melon aphid

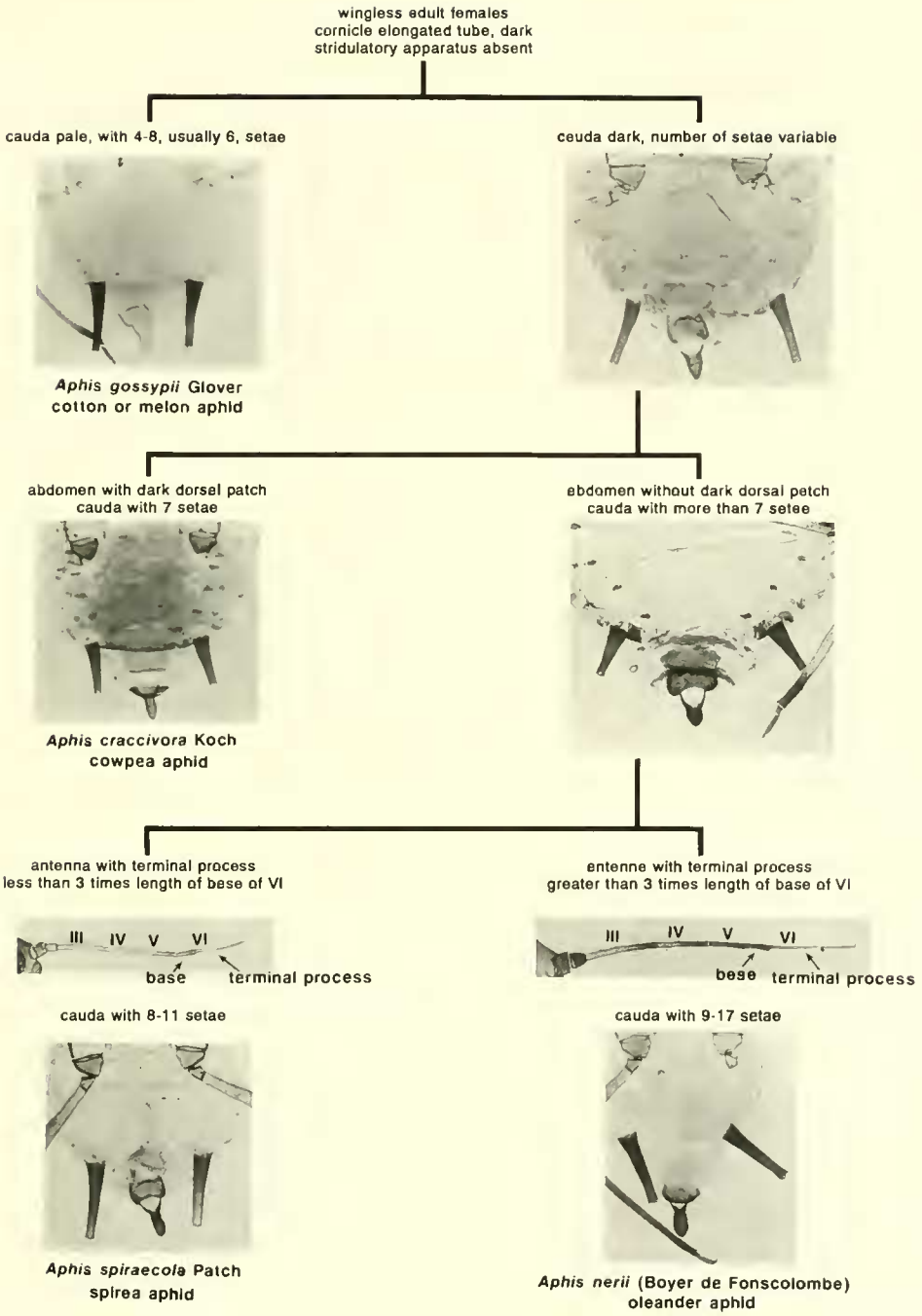

Fig. 4. Pictorial key to wingless adult females whose cornicles are dark, elongated tubes, who lack a stridulatory apparatus, and who are pests or potential pests of *Citrus* in the United States.

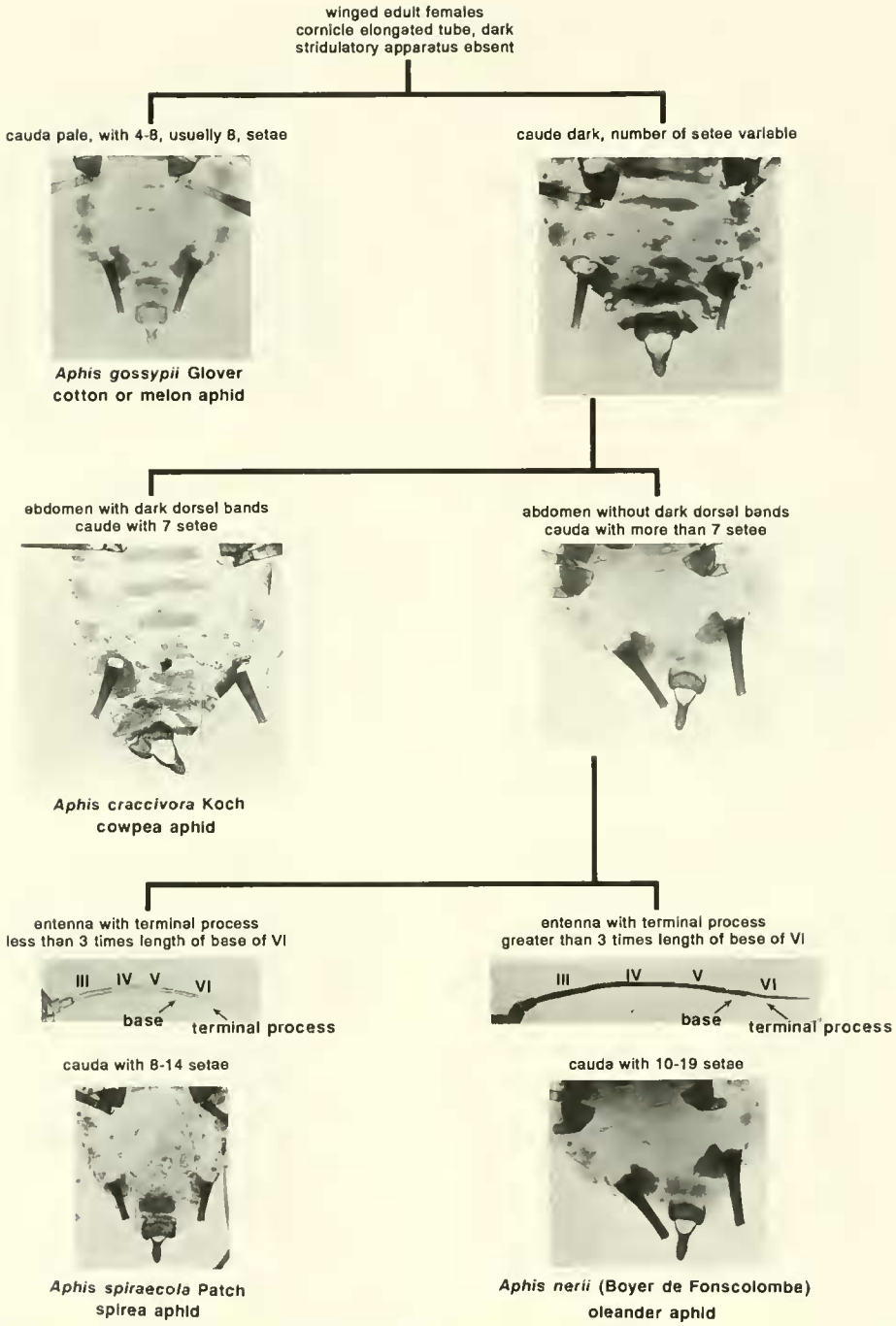

Fig. 5. Pictorial key to winged adult females whose cornicles are dark, elongated tubes, who lack a stridulatory apparatus, and who are pests or potential pests of *Citrus* in the United States.

Taxonomic characteristics.—*Wingless adult female:* In life body color varies from blackish green to green to pale yellow to almost white. Small aphid, 0.9–1.8 mm in length, rounded. Antenna 6 segmented, terminal process 2–3 times length of base of antennal segment VI; no secondary sensoria. Cornicle black, cylindrical, more than 3 times as long as wide. Cauda pale to dusky, with 4–8, usually 6, setae.

Winged adult female: In life body color varies from green to almost black to pale yellow to almost white. Small aphid, 1.1–1.8 mm in length, rounded. Antenna 6 segmented, terminal process 2–3 times length of base of antennal segment VI; secondary sensoria 6–12 of similar size on III and none on IV. Cornicle black, cylindrical, more than 3 times as long as wide. Cauda pale to dusky, with 4–8, usually 6, setae.

Hosts.—Minor pest of *Citrus.* Polyphagous and very damaging to many plants of economic importance including cotton and various Cucurbitaceae.

Distribution in the United States.—Throughout the United States.

Distribution in the world.—Throughout the world.

Discussion.—*Aphis gossypii* is a vector of over 50 plant viruses and is reported to be a vector of citrus tristeza virus (Kennedy et al. 1962). Colonies are regularly tended by ants.

Aphis nerii Boyer de Fonscolombe 1841
(Figs. 1, 4, 5)

**Aphis lutescens* Monell 1879
***Aphis nerii* Boyer de Fonscolombe
ESA-approved common name: oleander aphid
Other common name: milkweed aphid

Taxonomic characteristics.—*Wingless adult female:* In life with warning coloration of bright yellow or yellowish-orange body with black cornicles and cauda and usually black antennae and legs. Small aphid, 1.5–2.6 mm in length, rounded. Antenna 6 segmented, terminal process more than 3–4 times length of base of antennal segment VI; no secondary sensoria. Cornicle black, long. Cauda black, elongate, with 9–17 setae.

Winged adult female: In life with warning coloration of bright yellow or yellowish-orange body with black cornicles and cauda and usually black antennae and legs. Small aphid, 1.5–2.6 mm in length, rounded. Antenna 6 segmented, terminal process more than 3–4 times length of base of antennal segment VI; secondary sensoria 6–13 on III and 0–5 on IV. Cornicle black, long. Cauda black, elongate, with 10–19 setae.

Hosts.—Minor pest of *Citrus.* Found mainly on plants in the Asclepiadaceae, especially *Asclepias* spp., and the Apocynaceae, especially *Nerium oleander* L.

Distribution in the United States.—Throughout the United States.

Distribution in the world.—Distributed throughout the tropics and subtropics including many Pacific Islands and into the southern nearctic.

Discussion.—*Aphis nerii* is found occasionally on plants in families other than Asclepiadaceae and Apocynaceae and is known to transmit a few plant viruses (Blackman and Eastop 1984).

Aphis spiraecola Patch 1914
(Figs. 1, 4, 5)

**Aphis spiraecola* Patch
***Aphis citricola* van der Goot 1912
ESA-approved common name: spirea aphid
Other common name: green citrus aphid

Taxonomic characteristics.—*Wingless adult female:* In life body yellowish green to apple green with head brownish and antennae and legs pale. Small aphid, 1.2–2.2 mm in length, rounded. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI; no

secondary sensoria. Cornicle dark brown to black, cylindrical. Cauda dark brown to black, elongate, with 8–11 setae.

Winged adult female: In life body yellowish green with head and thorax brownish. Small aphid, 1.2–2.2 mm in length, rounded. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI; secondary sensoria 4–10 on III and 0–4 on IV. Cornicle black, cylindrical. Cauda black, elongate, with 8–14 setae.

Hosts.—Major pest of *Citrus.* Polyphagous with numerous host plants in over 20 families, especially in Asteraceae, Caprifoliaceae, Rosaceae, Rubiaceae, and Rutaceae, including *Citrus.*

Distribution in the United States.—Throughout the United States.

Distribution in the world.—Throughout the world.

Discussion.—*Aphis spiraecola* often causes curling and distortion of leaves and is reported to be a vector of a few plant viruses, including citrus tristeza virus (Kennedy et al. 1962). Colonies are usually tended by ants.

Aulacorthum solani
(Kaltenbach 1843)
(Figs. 1, 6, 7)

**Myzus solani* (Kaltenbach)
***Aulacorthum solani* (Kaltenbach)
ESA-approved common name: foxglove aphid
Other common name: potato aphid

Taxonomic characteristics.—*Wingless adult female:* In life pale green to yellow, black tips on antennal segments and cornicles. Small to medium-sized aphid, 1.8–3.0 mm in length, oval. Antenna 6 segmented, terminal process 5–6 times length of base of antennal segment VI; secondary sensoria 1–6 on III. Cornicle with tip dark, cylindrical, with distinct flange and 2 rows of cross striations. Cauda pale, with 6 setae.

Winged adult female: In life yellowish green with brownish head and thorax and dorsum of abdomen with dark, broken, transverse bars. Small to medium-sized aphid, 2.0–3.0 mm in length, oval. Antenna 6 segmented, terminal process 5–6 times length of base of antennal segment VI; secondary sensoria 8–13 on III and none on IV. Cornicle with tip dark, cylindrical, with distinct flange and 2 rows of cross striations. Cauda pale, with 6 setae.

Hosts.—Minor pest of *Citrus.* Polyphagous on many families of both dicots and monocots, but not grasses. It is a common pest in greenhouses.

Distribution in the United States.—Throughout the United States.

Distribution in the world.—Throughout the world.

Discussion.—*Aulacorthum solani* is reported as a vector of over 40 plant viruses (Blackman and Eastop 1984).

Brachycaudus helichrysi
(Kaltenbach 1843)

**Aphis helichrysi* Kaltenbach
***Brachycaudus helichrysi* (Kaltenbach)
Other common names: leaf-curl plum aphid, leaf-curling plum aphid, peach leaf curl aphid

Taxonomic characteristics.—*Wingless adult female:* In life body green to brownish yellow with a waxy bloom. Small aphid, 0.9–2.0 mm in length, oval. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI; no secondary sensoria. Cornicle pale, tapering, smooth. Cauda pale, helmet-shaped, not longer than width at base, with 5–7 setae.

Winged adult female: In life body head and thorax dark, abdomen green with dark lateral areas on some segments. Small aphid, 1.1–2.2 mm in length, oval. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI; secondary sensoria 20–30 on III and 10–12 on IV. Cornicle pale to dusky, tapering, smooth.

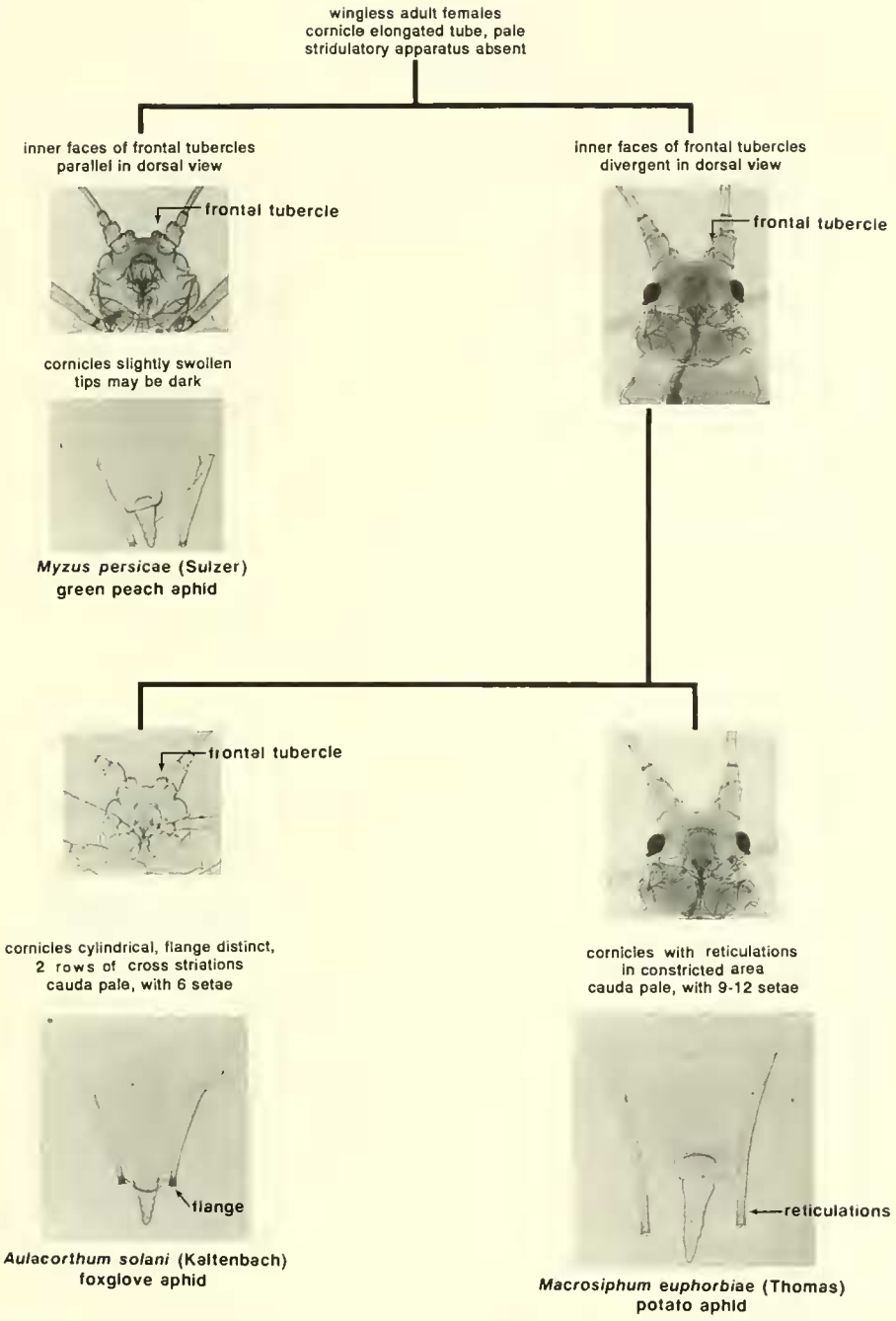

Fig. 6. Pictorial key to wingless adult females whose cornicles are pale, elongated tubes, who lack a stridulatory apparatus, and who are pests or potential pests of *Citrus* in the United States.

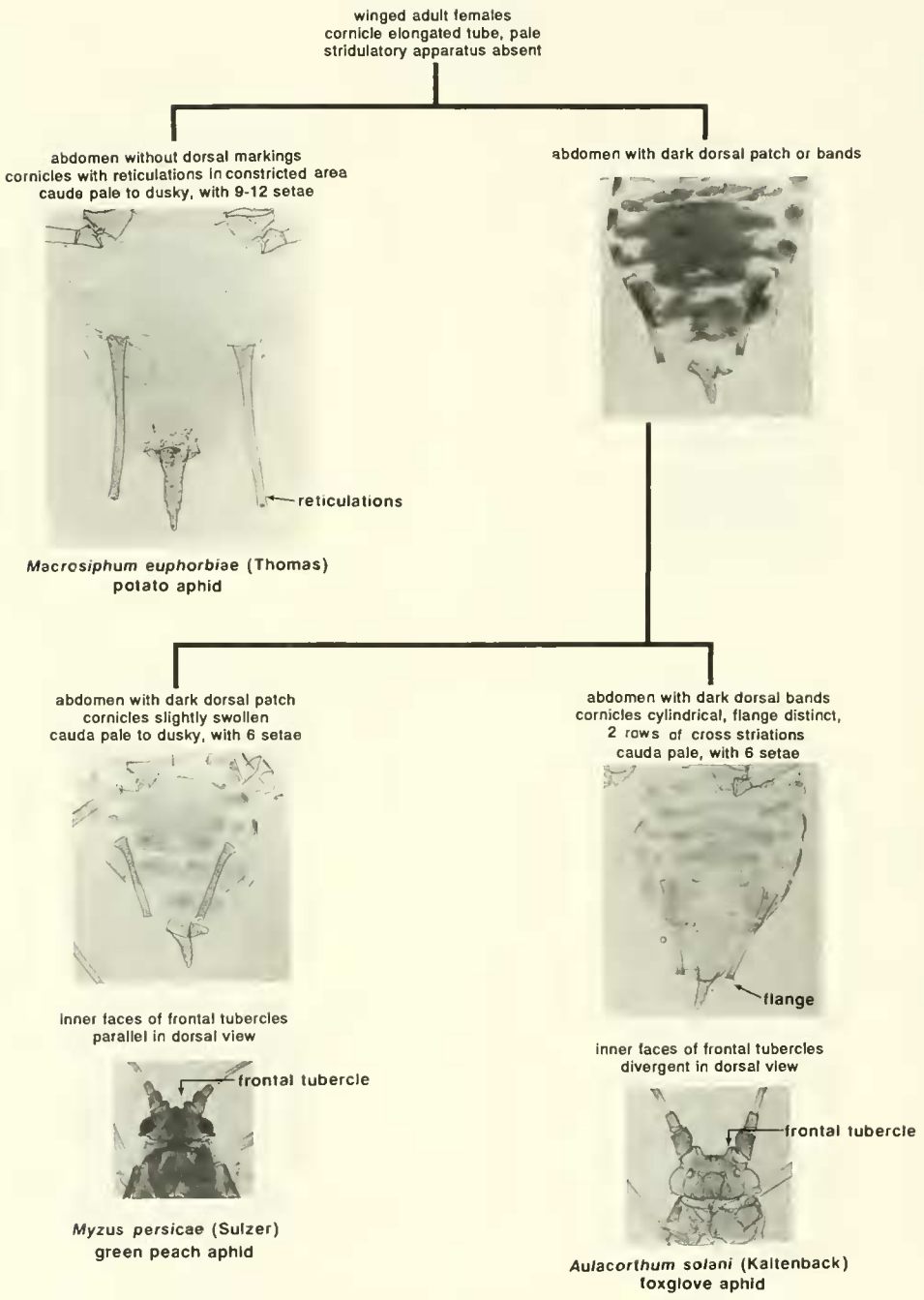

Fig. 7. Pictorial key to winged adult females whose cornicles are pale, elongated tubes, who lack a stridulatory apparatus, and who are pests or potential pests of *Citrus* in the United States.

Cauda pale, helmet-shaped, not longer than width at base, with 5–7 setae.

Hosts.—Minor pest of *Citrus*. Primary host plants are various species of *Prunus*, especially *domestica* L., *insititia* L., and *spinosa* L. Secondary hosts are numerous species of Compositae, Boraginaceae, and Leguminosae.

Distribution in the United States.—Throughout the United States.

Distribution in the world.—Throughout the world.

Discussion.—*Brachycaudus helichrysi* usually causes leaf curling or rolling and is reported to be a vector of several plant viruses (Blackman and Eastop 1984).

Macrosiphum euphorbiae
(Thomas 1878)
(Figs. 1, 6, 7)

**Macrosiphum solanifolii* (Ashmead 1882)
***Macrosiphum euphorbiae* (Thomas)
ESA-approved common name: potato aphid

Taxonomic characteristics.—*Wingless adult female:* In life body color usually varying shades of green with eyes distinctly reddish. Small to medium-sized aphid, 1.7–3.6 mm in length, pear shaped. Antenna 6 segmented, either entirely dark or dark only apically; terminal process more than twice length of base of antennal segment VI; secondary sensoria 1–5 on basal half of III. Cornicle entirely pale or becoming increasingly dusky towards tip, reticulated apically and slightly constricted in area of reticulations; more than 3 times as long as wide. Cauda pale, with 9–12 setae.

Winged adult female: In life body color usually varying shades of green with eyes distinctly reddish. Small to medium-sized aphid, 1.7–3.4 mm in length, pear shaped. Antenna 6 segmented, entirely dark except for segments I, II and base of III; terminal process more than twice length of base of antennal segment VI; secondary sensoria 10–18 on III and none on IV. Cornicle may be pale but usually progressively darker towards tip, reticulated apically and slightly constricted in area of reticulations; more than 3 times as long as wide. Cauda pale, with 9–12 setae.

Hosts.—Minor pest of *Citrus*. Polyphagous, feeding on over 200 plant species in more than 20 families, and very damaging to many plants of economic importance which are secondary host plants. Primary hosts are several species of *Rosa*.

Distribution in the United States.—Throughout the United States.

Distribution in the world.—Throughout the world.

Discussion.—*Macrosiphum euphorbiae* is reported as a vector of over 45 plant viruses (Blackman and Estop 1984).

Myzus persicae (Sulzer 1776)
(Figs. 1, 6, 7)

*,***Myzus persicae* (Sulzer)
ESA-approved common name: green peach aphid
Other common name: peach-potato aphid

Taxonomic characteristics.—*Wingless adult female:* In life body color varies from dark green to grey green to pale yellow. Small aphid, 1.2–2.3 mm in length, oval. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI; no secondary sensoria. Cornicle pale but tip may be dark, cylindrical to slightly swollen, more than 3 times as long as wide. Cauda pale to dusky, with 6 setae. Tarsi may be dark.

Winged adult female: In life body color varies from dark green to grey green with a large black patch on the dorsum of the abdomen. Small aphid, 1.2–2.3 mm in length, oval. Antenna 6 segmented, terminal process more than twice length of base of antennal segment VI; secondary sensoria 10–15 in a straight line on III; none on IV. Cornicle pale but tip may be dark, slightly swollen, more than 3 times as long as wide. Cauda pale to dusky, with 6 setae. Tarsi may be dark.

Hosts.—Major pest of *Citrus*. Polyphagous and very damaging to many plants, including *Citrus*, that are secondary host plants and are of economic importance. Primary hosts are several species of *Prunus*.

Distribution in the United States.—Throughout the United States.

Distribution in the world.—Throughout the world.

Discussion.—*Myzus persicae* is the most important aphid vector of plant viruses, reported to transmit well over 100 plant vi-

ruses, including citrus tristeza virus (Kennedy et al. 1962).

Pterochloroides persicae
(Cholodkovsky 1899)
(Fig. 1)

***Pterochloroides persicae* (Cholodkovsky)
Other common names: clouded peach bark aphid, cloudy-winged peach aphid

Taxonomic characteristics.—*Wingless adult female:* In life shiny, dark brown or black with some white coloration; ventral surface silvery white. Medium to large aphid, 2.7–4.5 mm in length, oval. Antenna 6 segmented, short, terminal process fingerlike, shorter than base of antennal segment VI; secondary sensoria 0–7 (usually none) on III and 1–3 on IV. Cornicle dark, a large, truncated cone with many setae. Cauda rounded, not well developed. Abdomen with a double row of large tubercles on dorsum.

Winged adult female: In life shiny, dark brown or black with some white coloration. Medium to large aphid, 2.7–3.6 mm in length, oval. Antenna 6 segmented, short, terminal process fingerlike, shorter than base of antennal segment VI; secondary sensoria 10–14 on III and 1–5 on IV. Cornicle dark, a large, truncated cone with many setae. Cauda rounded, not well developed. Abdomen with a double row of large tubercles on dorsum. Forewings with large pigmented areas along veins.

Hosts.—Status as pest of *Citrus* unknown. Known from several species of *Prunus*, especially *armeniaca* L., and *persica* (L.) Batsch., but also *amygdalus* Batsch., *cerasus* L., *domestica* L., and *spinosa* L. Also recorded from *Citrus, Cydonia vulgaris* Pers., and *Malus pumila* Mill.

Distribution in the United States.—Not known to occur in the United States.

Distribution in the world.—Known to occur in Central Asia (India and Pakistan); the Middle East; the Mediterranean area; and in Europe (Italy and Yugoslavia).

Discussion.—*Pterochloroides persicae* is probably Asian in origin. It is a pest of various species of *Prunus* (almond, apple, apricot, peach, etc.) and has been reported to occur on *Citrus*. Large populations occurring on the bark can cause fruit to fall prematurely or not to develop. The aphids are tended by ants and produce copious amounts of honeydew which serve as a substrate for sooty molds.

Key to the Wingless Adult Female Aphids that are Potential Pests of *Citrus* in the United States

1	Cornicle with opening a mere ring on a large, dark circular base with appearance of hairy truncated cone; antennal segment VI short, its terminal process fingerlike; cauda rounded, not well developed; abdomen with a double row of large tubercles on dorsum (Fig. 1)	clouded peach bark aphid, *Pterochloroides persicae* (Cholodkovsky)
–	Cornicle with opening at end of elongated tube that is variable in length, shape, and color; antennal segment VI elongate, terminal process more than twice length of base of VI; cauda well developed; abdomen lacking double row of tubercles	2
2(1)	Stridulatory apparatus (Fig. 1) present and consisting of cuticular pattern on venter of abdomen under cornicle and row of short, peg-like setae on hind tibia	3
–	Stridulatory apparatus absent	6
3(2)	Abdomen and whole body dark (Fig. 2)	*Toxoptera victoriae* Martin
–	Abdomen and whole body not dark	4
4(3)	Antenna with segments III, IV, V, and base of VI banded apically; cauda with less than 20 setae (Fig. 2)	black citrus aphid, *Toxoptera aurantii* (Boyer de Fonscolombe)
–	Antenna not banded, segments III and IV pale	5
5(4)	Cornicles longer than cauda; cauda with more than 25 setae; antenna with segments V and VI dark (Fig. 2)	brown citrus aphid, *Toxoptera citricida* (Kirkaldy)
–	Cornicles shorter than cauda; cauda with less than 20 setae; antenna with all segments pale (Fig. 2)	*Toxoptera odinae* (van der Goot)
6(2)	Cornicle dark	7
–	Cornicle pale, tip may be dark	10
7(6)	Cauda pale (Fig. 4)	cotton aphid, *Aphis gossypii* Glover
–	Cauda dark	8

8(7) Abdomen with dark dorsal patch; cauda with 7 setae (Fig. 4) ..... cowpea aphid, *Aphis craccivora* Koch
– Abdomen without dark dorsal patch; cauda with more than 7 setae 9
9(8) Antenna with terminal process less than 3 times length of base of VI; cauda with 8–11 setae (Fig. 4) ..... spirea aphid, *Aphis spiraecola* Patch
– Antenna with terminal process more than 3 times length of base of VI; cauda with 9–17 setae (Fig. 4) ..... oleander aphid, *Aphis nerii* (Boyer de Fonscolombe)
10(6) Cauda helmet-shaped, not longer than basal width (not figured) ..... leaf-curl plum aphid, *Brachycaudus helichrysi* (Kaltenbach)
– Cauda elongated, length more than twice basal width 11
11(10) Frontal tubercles with inner faces parallel in dorsal view; cornicle slightly swollen, tip may be dark; cauda pale to dusky, with 6 setae (Fig. 6) ..... green peach aphid, *Myzus persicae* (Sulzer)
– Frontal tubercles with inner faces divergent in dorsal view; cornicle and cauda variable 12
12(11) Cornicle cylindrical, tip dark, with distinct flange and 2 cross striations; cauda pale, with 6 setae (Fig. 6) ..... foxglove aphid, *Aulacorthum solani* (Kaltenbach)
– Cornicles constricted near tip in area of reticulations; cauda pale to dusky, with 9–12 setae (Fig. 6) ..... potato aphid, *Macrosiphum euphorbiae* (Thomas)

Key to the Winged Adult Female Aphids that are Pests or Potential Pests of *Citrus* in the United States

1 Cornicle with opening a mere ring on a large, dark circular base with appearance of hairy truncated cone; antennal segment VI short, its terminal process fingerlike; cauda rounded, not well developed; abdomen with a double row of large, spinal tubercles on dorsum; forewings with large pigmented areas along veins (Fig. 1) ..... clouded peach bark aphid, *Pterochloroides persicae* (Cholodkovsky)
– Cornicle with opening at end of elongated tube that is variable in length, shape, and color; antennal segment VI elongate, terminal process more than twice length of base of VI; cauda well developed; abdomen lacking double row of spinal tubercles; forewings hyaline 2
2(1) Stridulatory apparatus (Fig. 1) present and consisting of cuticular pattern on venter of abdomen under cornicle and row of short, peg-like setae on hind tibia 3
– Stridulatory apparatus absent 5
3(2) Cornicles shorter than cauda; antenna with segments pale; forewing with pterostigma pale and media twice branched (Fig. 3) ..... *Toxoptera odinae* (van der Goot)
– Cornicles longer than cauda; antenna with segment III wholly black or banded apically; forewing with pterostigma pale or dark and media once or twice branched 4
4(3) Antenna with segment III wholly black, segments IV, V, and base of VI banded apically; forewing with pterostigma pale and media usually twice branched (Fig. 3) ..... brown citrus aphid, *Toxoptera citricida* (Kirkaldy)
– Antenna with segments III, IV, V, and base of VI banded apically; forewing with pterostigma dark and media once branched (Fig. 3) ..... black citrus aphid, *Toxoptera aurantii* (Boyer de Fonscolombe)
5(2) Cornicle dark 6
– Cornicle pale, tip may be dark 9
6(5) Cauda pale (Fig. 5) ..... cotton aphid, *Aphis gossypii* Glover
– Cauda dark 7
7(6) Abdomen with dark dorsal bands; cauda with 7 setae (Fig. 5) ..... cowpea aphid, *Aphis craccivora* Koch
– Abdomen without dark dorsal bands; cauda with more than 7 setae 8
8(7) Antenna with terminal process less than 3 times length of base of VI; cauda with 8–14 setae (Fig. 5) ..... spirea aphid, *Aphis spiraecola* Patch
– Antenna with terminal process more than 3 times length of base of VI; cauda with 10–19 setae (Fig. 5) ..... oleander aphid, *Aphis nerii* (Boyer de Fonscolombe)
9(5) Cauda helmet-shaped, not longer than basal width (not figured) ..... leaf-curl plum aphid, *Brachycaudus helichrysi* (Kaltenbach)
– Cauda elongated, length more than twice basal width 10
10(9) Abdomen without dorsal markings; cornicles constricted near tip in area of reticulations; cauda pale to dusky, with 9–12 setae (Fig. 7) ..... potato aphid, *Macrosiphum euphorbiae* (Thomas)
– Abdomen with dark dorsal patch or bands; cornicles and cauda variable 11
11(10) Abdomen with dark dorsal patch; cornicle slightly swollen, tip may be dark; cauda pale to dusky, with 6 setae; frontal tuber-

cles with inner faces parallel in dorsal view (Fig. 7) . . . . . green peach aphid, *Myzus persicae* (Sulzer)

– Abdomen with dark, dorsal, broken, transverse bars; cornicle cylindrical, tip dark, with distinct flange and 2 cross striations; cauda pale, with 6 setae; frontal tubercles with inner faces divergent in dorsal view (Fig. 7) . . . . . foxglove aphid, *Aulacorthum solani* (Kaltenbach)

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